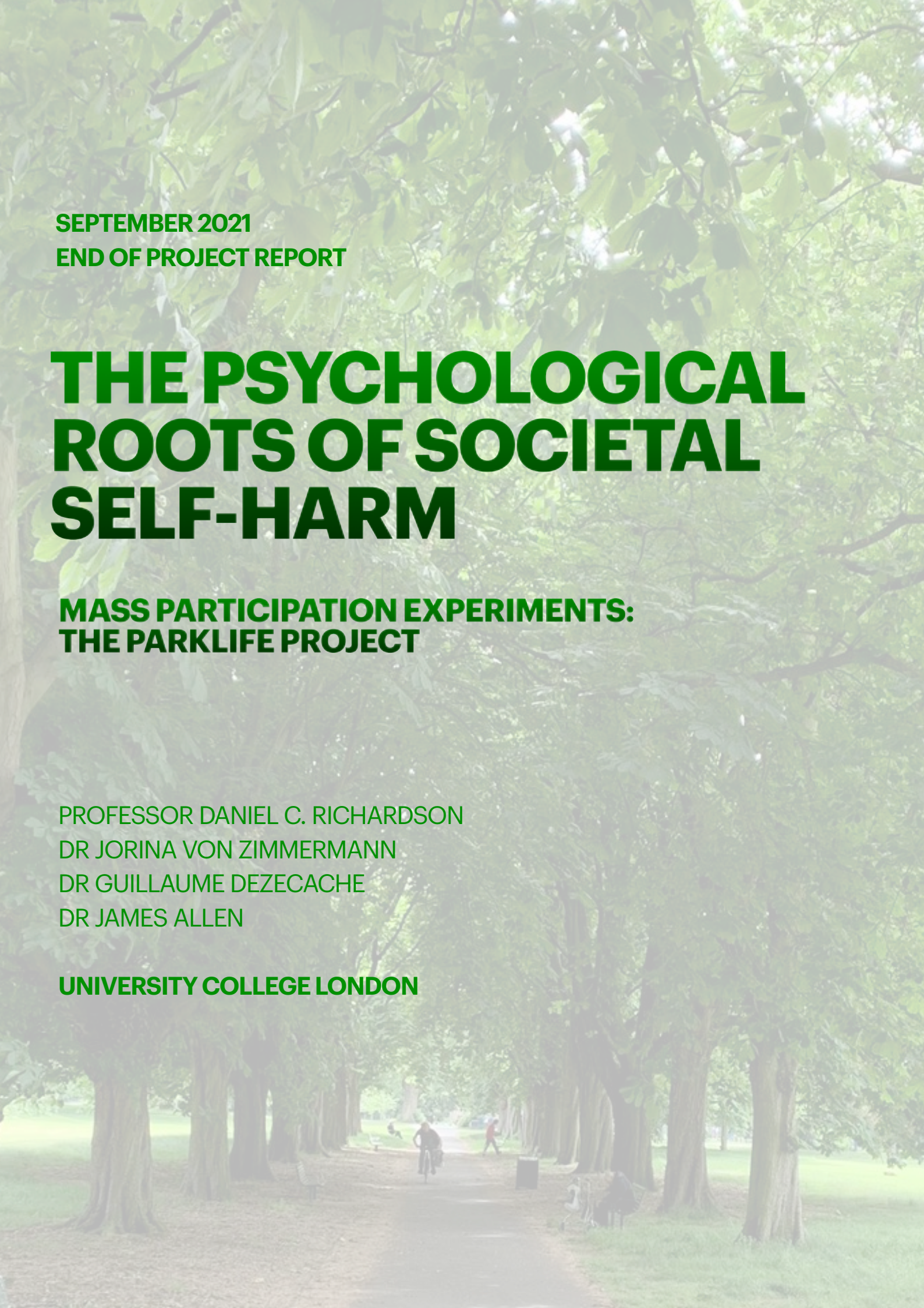

SEPTEMBER 2021
END OF PROJECT REPORT

# THE PSYCHOLOGICAL ROOTS OF SOCIETAL SELF-HARM

## MASS PARTICIPATION EXPERIMENTS: THE PARKLIFE PROJECT


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# ACKNOWLEDGMENTS

This project was funded by the Nuffield Foundation (*The Psychological Roots of Societal Self Harm*, 42868). We are hugely grateful for the insight, guidance and encouragement they provided throughout the project. In particular, we could not have asked for more patience or helpful funders as we dealt with the problems of carrying out group research during the pandemic.

The Nuffield Foundation is an independent charitable trust with a mission to advance social well-being. It funds research that informs social policy, primarily in Education, Welfare, and Justice. It also funds student programmes that provide opportunities for young people to develop skills in quantitative and scientific methods. The Nuffield Foundation is the founder and co-funder of the Nuffield Council on Bioethics and the Ada Lovelace Institute. The Foundation has funded this project, but the views expressed are those of the authors and not necessarily the Foundation. Visit www.nuffieldfoundation.org for more information.

Additional support was provided by a British Academy Newton International Fellowship (NF 171514) and Alumni Follow-on Funding awarded to GD. GD also acknowledges the support received from the Agence Nationale de la Recherche of the French government through the program *Investissements d'Avenir* (16-IDEX-0001 CAP 20-25).

We would like to thank our advisory committee for their insightful guidance (Prof John Drury, Dr Ilka Gleibs, Dr Greg B Davis, Dr Matt Gobel, Prof Lasana Harris, Dr Rod Abouharb) and the team at Cauldron Science for turning our ideas into engaging, playable games. We'd like to thank the students and collaborators who gave their energy and creativity to these experiments, and finally, our many participants, who built very many beautiful parks.


## THE PARKLIFE PROJECT

# EXECUTIVE SUMMARY

## PREFACE (WE PREDICT A RIOT)

Riots are unpredictable, dangerous, and relatively rare. This means, for scientists, they are hard to study in the moment. Our understanding of riots is limited to *population* statistics about poverty levels or political attitudes, on the one hand, and the introspection of *individuals*, on the other. What was missing, it seemed to us, was a detailed understanding of the *group dynamics* of a riot. How does individual discontent accumulate into group anger, and what turns collective action into societal self-harm?

With the support of the Nuffield Foundation, we created a game, Parklife, to investigate these issues. It is played by two groups of people in teams. Each team works together, tapping on their mobile phones, to build their park. Or they can act - individually or as a group - to vandalise the other team's park. Crucially, the game is sometimes unfair. One team has to work harder than the other. This simple game captures the moment that individual frustration leads to collective, antisocial action. It allowed us, over many experiments and computational models, to investigate the psychological mechanisms linking frustration, social inequality and shared identity.

There was an irony, of course, that a project on group dynamics took place during a global pandemic lockdown that banned group gatherings. Thankfully, we were able to rapidly adapt our paradigm to collect data online, which we did both in the UK and across the world. As the project continued, our research themes were played out on a grand scale in life under lockdown: the disproportionate effect of the pandemic on the poorest in society, and the massive growth in wealth for the richest; whether to wear a mask to protect yourself, or to protect your community. In each case, the same factors of individual versus collective action collided with a sense of individual versus collective responsibility and outrage. In this document we present the scientific conclusions from our experiments, and discuss how they can be applied to a world of growing inequality, protest and conflicting social identities.

# BACKGROUND

In the London riots of 2011 five people died, many more were injured, and more than £200 million of property was damaged (Bencsik, 2018). We used the term 'societal self harm' in this project to highlight the fact that - in cold, rational terms - there seems to be nothing to be gained from a riot. Though looting can occur, for the most part those who riot can cause great damage to their own local environment, place themselves at risk of physical harm, and face being arrested and incarcerated. In this sense, riots are acts of self harm, with little personal or practical gain. To understand their causes, therefore, we have to understand the political, sociological and psychological forces at play.

What causes riots? There are broadly three types of answer.

First, as illustrated above by the *Daily Mail*, there is the 'bad apple' explanation. This view holds that there is a *type of individual* who is responsible for a riot. They are usually described in disparaging language as yobs, thugs, with animalistic language such as 'feral' youths. The implication is that in everyday life such people are kept in check by rules and enforcement, but when the circumstances of a riot occur, a 'mob mentality' takes over (Le Bon, 1986) and their true nature is unleashed. This is 'criminality pure and simple,' as the Prime Minister David Cameron said at the time.

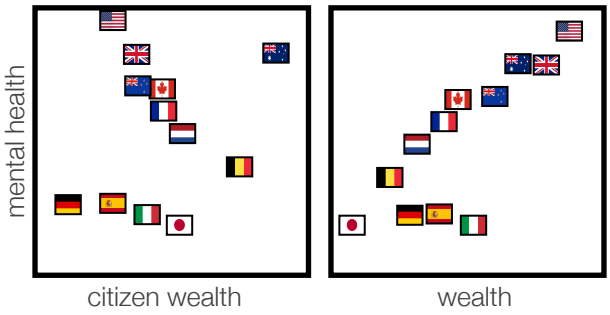
Secondly, there is a *social identity* explanation (Stott & Drury, 2017). Riots emerge when a group shares a social identity, and believes that there is a shared problem and that collective action is a viable means for change (Reicher, 1984; Stott et al., 2018). In the specific case of the London riots, for example, there was a history of conflict between the police and the local Black community that was heightened by the police shooting of Mark Duggan. The riots were a consequence of how individuals connected that history and the unfolding events to their own social identities.

Psychologists have found that the effect of groups upon our behaviour is so strong that prejudice, discrimination and intergroup conflict can literally be induced by a coin toss (Tajfel, 1978). In these 'minimal group' experiments, participants interact in games in which they can punish or reward others, or make judgements about them (Fisher, 1993). Though they are placed in teams by a random toss of a coin, they will systematically reward their own in-group and punish the other out-group (Tajfel & Turner, 1986); they will believe their in-group members are more honest and intelligent, and attribute darker motives and worse intentions to the out-group.

Finally, there is the *relative deprivation* explanation for riots (Gurr, 1970). This theory holds that when people perceive a difference between what they have and what they believe they deserve, they feel relatively deprived. As the perceived disparity grows, so do frustration and resentment, increasing the likelihood for collective violence. For example, the bread riots of the 18th century France were not due to the absolute levels of starvation. According to relative deprivation theory, they were caused by the difference between what the rioters had, and what they perceived the others possessed. Relative deprivation has been hotly contested over the years by academics because of debates about how it should be measured, and the degree to which historically it is able to predict collective action (McPhail, 1971; Spilerman, 1976; Tilly, 1971; Smith et al., 2012; Obaidi et al., 2019).

The importance of the *relative distribution* of resources was revived by the highly influential work of Wilkinson & Pickett (2009). In *The Spirit Level,* they took an epidemiological approach to studying social problems such as mental health, prisons rates and drug abuse. These societal ills have been linked to poverty for some time since, for example, good health care can require considerable resources from an individual or society. But Wilkinson and Pickett agreed that these problems have a far stronger link to the *relative distribution* of those resources. In other words - wealth distribution has a psychological consequence, as well as an economic one.

Here for example, the position of the flags shows the % of the population who have mental health problems, plotted against a measure of wealth of an average citizen (left), versus a measure of the distribution of that wealth across society (right), such as the ratio between the bottom and top 10% of earners.



*from Wilkinson & Pickett (2009)*

There has been much discussion over the strength and validity of these demographic relationships (e.g., Snowdon, 2010). The way that inequality or mental health is measured can be contested, and everyone would agree that it's impossible to prove a causal relationship from a statistical correlation. So recently, researchers have turned to laboratory studies to investigate the ways in which social inequality can have a psychological impact (Abbink et al., 2018; Greitemeyer & Sagioglou, 2016, 2017). This is the methodology we used to investigate not only social inequality, but how it interacts with social identities and the characteristics of individuals who riot.

# PROJECT AIMS

- Create a game for groups of people that captures the psychological links between effort, inequality and intergroup conflict
- Test the hypothesis that inequality has a direct, causal effect on levels of intergroup conflict
- Investigate whether intergroup conflict is caused by certain types of individual, or certain types of situation
- Use computational models to understand the dynamic relationship between individual and group behaviour
- Explore how the different social identities an individual can share with their group changes how they respond to social inequality
- Engage with stake holders and members of the public, explaining the process of experimental social science, and what it can tell us about the effects of social inequality in the real world

Importantly, our objective is this project was not to create a *realistic simulation* of a riot. In the real world, the decision to be engaged in a riot - risking potential harm to others, to property and to oneself - has huge moral and practical repercussions. We are not attempting to simulate any of those factors in our game. Instead, we are following the classic laboratory practice of isolating a few key variables, and trying to replicate their interactions in the lab.

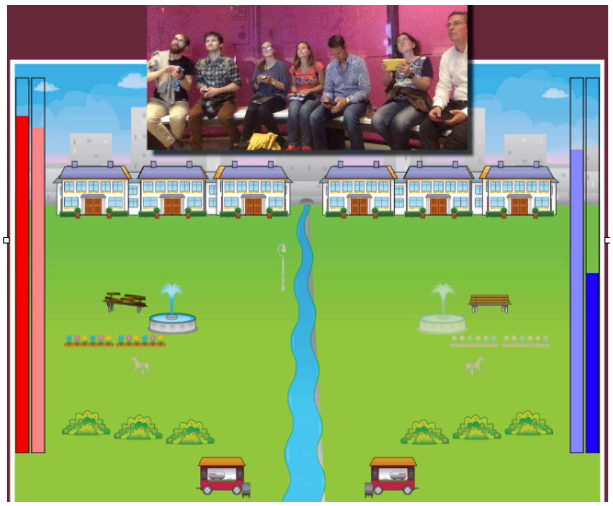
Our game is a sort of psychological petri dish, if you will: a controlled environment where we can re-create conditions of frustration, unfairness and social affiliation that occur in a real life on a very different scale. If we can understand how theses factors combine to produce intergroup conflict in the game, then we hope that we can shed light on how those same psychological processes are at work in a real life riot.

All reports, data collected and computer code used for this project are freely available on the Open Science Foundation (https://osf.io/kqc3t/).

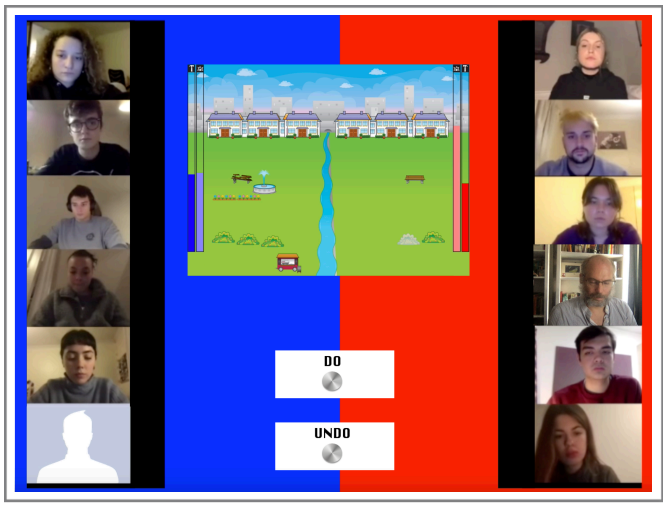
## PARKLIFE PHASE 1: THE CONSEQUENCES OF SOCIAL INEQUALITY

In the first phase of our project, we created the computer game, Parklife. Unlike many games used in psychology, Parklife is played by multiple people, who can be in the physical presence of one another, or in their virtual presence online. It resembles popular 'time management' games where players expend effort to develop resources, and are rewarded by a growing world.

### PARKLIFE IN PERSON



### PARKLIFE IN ONLINE




On the left is an image of the Parklife display that is seen by participants who are playing at the London Science Museum. On the right - during the Covid pandemic lockdown - participants are playing from home online, and can see videos of other players.

Parklife can be played with up to a hundred people, as we have done in talks and demonstrations at schools, museums, academic conferences and business meetings. But for most of our experiments, we run in small groups of approximately 12 people. Once players log on to our system using a browser on their phone or tablet, we assign them to teams. In the first phase, we assigned people at random. We show people their parks on a large, shared display, and explain that they can build their park by tapping on the 'do' button. Every time someone on their team taps, a bar at the side of their park grows. When it reaches the top, a new park feature appears, such as a flower bed or set of swings. We explain that players have another choice. They can also choose to click on the undo button. Now all of their clicks cause a second bar to rise. When that reaches the top, a feature on the other team's park is vandalised. In the picture above, you can see that a few park benches have been smashed up.

We let people play Parklife for about 3 minutes. During the game they can click to build, click to vandalise, or sit still and do nothing. They typically don't talk to each other, although occasionally players will yell encouragement to their team mates, or grumble about the other team.

What's important here is that - in cold, rational terms - the choice to vandalise is entirely counterproductive. It doesn't help your park to trash the other team's. In fact, it harms it, because the tie you spend clicking on 'undo' is time you could have spent building and making your own park nicer.

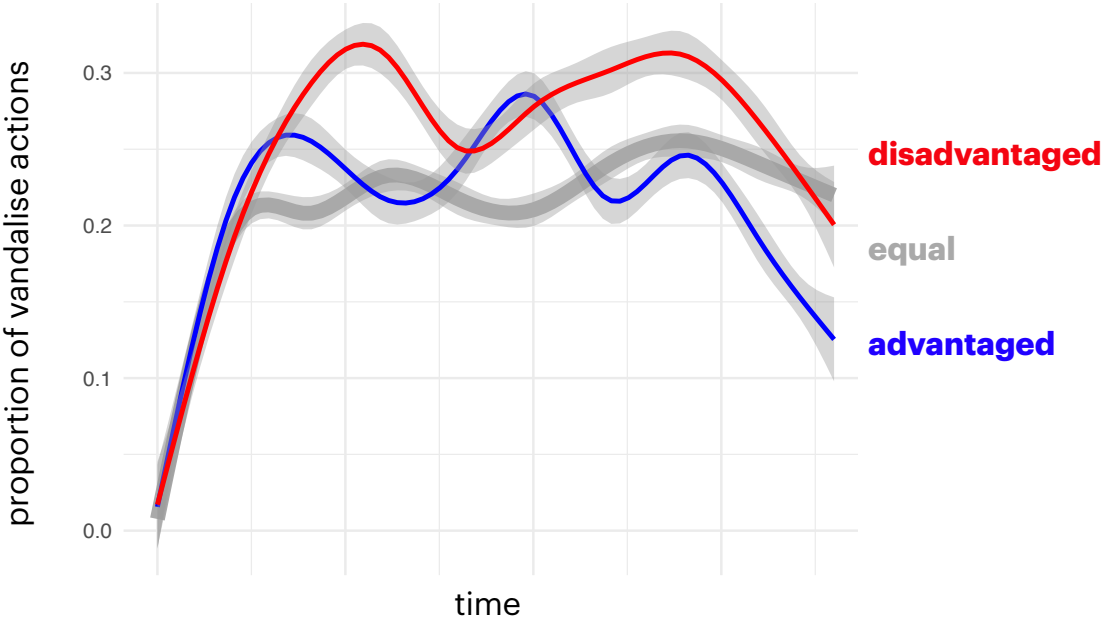
So why would anyone choose to vandalise another team's park?

Are there just some 'bad apples', people who will always resort to 'criminality, pure and simple'? The overwhelming answer from the thousands of people who have played Parklife is 'no'. It is true that some categories of people tend to engage in slightly more intergroup conflict. Men are a little more aggressive than women, for example. And children are slightly quicker to reach for the 'undo' button.

But we have looked across personality types, cultures, ages and political views, and we can find no evidence that there is a type of 'feral' person who is always more likely to engage in vandalism. Instead, intergroup conflict in our studies is reliably produced not by particular *people*, but by the particular *situation* of social inequality.

In our Parklife games, we manipulate social equality by changing the game settings behind the scenes. In our unequal games, the red team has to work harder - click more times on the do button - to get the same reward of a new park feature.

We find that whether we tell people that the game is unfair, or whether they find out as the red team slips behind, the result is the same. The situation of inequality directly causes a spike in intergroup conflict.




This plot shows the proportion of clicks to vandalise across the 3 minutes of playing, averaged over almost 200 players. When the two teams had an equal reward rate (grey line), they vandalise roughly a quarter of the time. But when the red team is at a disadvantage, vandalism rates increase to around a third of the time. Statistical analyses show that we can be sure that what we're seeing in these differences are not random patterns (with a confidence of greater than 99.7%) but a direct, causal link between the situation of inequality and an aggressive response against the outgroup.

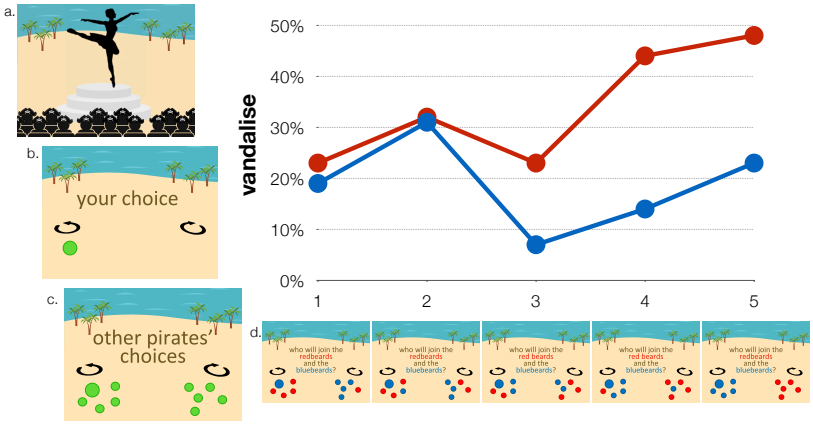
To explore our data, we turned to computational agent based models. This approach is able to test hypotheses about the behaviour of individuals when interacting in a group. For example, the complex, emergent behaviour of a murmuration of starlings can be modelled by a set of relatively simple rules that govern how individual birds respond to movement of other birds around them. Similarly, we set out to use agent based models to understand what set of rules for individual behaviour best described how groups of players interacted in Parklife.

Our models confirmed that social inequality, and the comparisons players saw between theirs and the other team's park, were key drivers of their vandalism behaviour. Moreover, the players were deliberately coordinating their actions with their team mates, only vandalising when they were confident others were still building. Rather than simply being frustrated individuals hitting out, the models revealed that under the pressure of social inequality, teams spontaneously coordinated their response.

# PARKLIFE PHASE 2: INDIVIDUAL CHARACTERISTICS OR SOCIAL IDENTITIES?

Being in a group who are disadvantaged leads directly to aggression against the advantaged group. What psychological factors make people feel part of group, and how does that reflect their response to social inequality?

Across several experiments, we have explored how the differences between players shape their collective action. We asked people whether they were left or right wing, or whether they were high or low SES, for example. We also told them how their team mates had answered. We found that firstly, individual differences did not predict hostility to the out-group. But what did increase levels of vandalism was players belief that they *shared* a particular characteristic with their team mates.




These findings led to a further experiment, carried out in collaboration with the Science Museum Bangalore. In this version of Parklife participants first saw a rotating ballerina (a, right), a type of visual illusion. People perceive either a rotation in one direction or another, and find it hard to imagine how anyone could see otherwise. Individual participants indicated which direction of rotation they saw (b). We then showed them what the other players saw (c), and told them 'some people say that the direction of rotation you see reveals a lot about your personality and cognitive style'. Finally, the dots change colour to show who is on the red team and who is on the blue (d). Crucially, some participants were told that they were either the only person on their team that saw that rotation, or that 2,3,4 or 5 other people saw the same rotation, as shown on the x axis.

This design allowed us to vary what we termed group coherence: the degree to which participants felt that the other people on their team were similar to them or not. Remarkably, this small manipulation had a dramatic effect on participants' behaviour when paying Parklife. As we can see, as we gradually increased the perceived similarity between a player and their team mates, we increased the strength of their response to social inequality.

# KEY FINDINGS, IMPLICATIONS AND RECOMMENDATIONS

We believe that there are four key take home messages from the Parklife project. Each has particular implications for policy, practice and future research.

## INTERGROUP HOSTILITY IS NOT JUST CAUSED BY PARTICULAR TYPES OF PEOPLE

We find no evidence that a particular personality or demographic type is solely responsible for intergroup conflict. All participants, when faced with the circumstance of inequality, are more likely to engage in aggressive collective action.

However, when we ask players' afterwards, those that were advantaged attribute their success - and the disadvantaged teams' failing - not to the systematic bias in the game, but to differences between the characteristics of people who were playing on either team. In short, riots are made by situations, not people. But in the aftermath, there is a psychological bias to blame the people alone. A clear policy implication of this work is that it is wrong to demonise those involved in a riot, and drawing the conclusion that it is their personal failings alone that are responsible.

## INEQUALITY BETWEEN GROUPS HAS A DIRECT, CAUSAL EFFECT ON LEVELS OF INTERGROUP CONFLICT

This distribution of resources in society has a psychological impact on individuals. Our work shows that at the level of individual and group behaviour, inequality has a direct link to acts of collective aggression. Therefore, our works adds evidence and motivation to policy arguments for addressing the widening economic gap.

In our games, the only outlay for discontent is to engage in vandalism. But in the real world there are other forms of collective action - protest, community organisation, collective bargaining - that perhaps could harness that response to inequality in more constructive ways

### THE SOCIAL IDENTITY OF A GROUP HAS A PROFOUND EFFECT ON THEIR RESPONSE TO SOCIAL INEQUALITY

As we titrated the level of participants' shared social identity, it compounded their response to inequality. The policy implication here is that how we frame, talk about and address different social groups - for example, as "residents of Tottenham", "members of the Black community", or "Londoners" - can have an immediate effect on their collective action.

### INEQUALITY AND SOCIAL IDENTITY CAN BE USED TO MODEL THE OUTBREAK AND SPREAD OF COLLECTIVE ACTION

We believe that the computational models developed in our project have exciting implications for understanding and predicting social unrest. Currently, our modelling of both Parklife and real populations suggest that there are two regimes associated with riot-like behaviour.  Inequality plays a key role in the first stage of initiating collective self-destructive action. At the second stage, rioting can spread through the imitation of social norms within groups, and so social identity becomes the key driver. Therefore, our models suggest policy makers must take into account a history of inequality and group membership, and that which factors are important depends on the point in the riot cycle that the community finds itself.

## CONCLUSION

In our work we have found that the best accounts of intergroup conflict come from considering both the inequalities between groups, and the strength of the social identities they share. Our results bring together different themes that had drifted apart in the literature, and find new evidence from controlled experiments and computational models. We hope that this work will encourage those invested in understanding the effects of inequality to use a wide variety of tools - psychological, computational and sociological - to understand these emergent behaviours. Finally, we hope that these results have brought new evidence to bear on long standing issues of social discontent, and new impetus to political efforts to address social inequality.

# PARKLIFE: END OF PROJECT REPORT

# OBJECTIVES

## RESEARCH

To experimentally investigate the psychological roots of societal self-harm, using an innovative game design to test hypotheses about collective and individual behaviour. Provide insights into the casual mechanisms and mediators of societal self-harm that are relevant to public policy.

## POLICY

To invigorate the policy debate on deprivation with new experimental evidence. Complement sociological and economic data on the correlates of societal self-harm, exploring the psychological consequences of social inequality and its impact on intergroup relations.

## PUBLIC ENGAGEMENT

To take our experiments to diverse communities in public engagement events. Created a museum installation that people could visit and take part in our experiments, and a rich website that explains our methods and results. Our objective is to give people from different backgrounds, both privileged and underprivileged, the experience of responding to pressures that challenge others in society.

# BACKGROUND

The last few years have seen the Arab Spring uprisings, worldwide, protests in support of #BlackLivesMatter, and a mob storm the US Capitol Building. Though people report being increasingly disillusioned with politics through the polls, protests and riots are increasingly influencing the political discourse. They are not, of course, a new phenomenon.

On the 10th of April in 1981 in Brixton, two policemen stopped a man who looked badly injured, and decided to take him to hospital. A group of 50 youths surrounded the convoy and started to throw stones and bottles at the car, attempting to free the injured man. One of the police officers later recollected:

> *We zoomed down there with our carrier into what looked like World War Three. Cars blazing, people running everywhere. The air was filled with orange smoke. Then suddenly this hurricane of bricks and bottles and God knows what other shit hits the roof of our van from the flats overhead. (Hernon, 2006).*

In the recent London riots of 2011, five people died, many more were injured, and property damage worth more than £200 million was reported. They caused widespread social tension and disruption (Bencsik, 2018). These examples, and many more, show that there is a scientific, economic and humanitarian imperative to understand the factors and mechanisms involved in violent collective protests.

Following Bohstedt (1994), riots can be defined as 'hostile collective action by a group of about 50 or more people who physically assault persons or property or coerce someone to perform an action'. Riots have long attracted the attention of social sciences, but their understanding has changed dramatically since Le Bon's (1895) seminal work, which portrayed crowds as irrational and mindless. Research today is focused on an analysis of the outcome of collective action, the mobilisation process, and the emergence of behavioural norms and a common social identity during riots (Reicher, 1984; Stott et al., 2018; Stott & Drury, 2017).

Why do people riot? According to Relative Deprivation Theory (RDT), when people perceive a difference between what they have, and what they believe they deserve,

they will feel relatively deprived. As the perceived disparity grows so do frustration and resentment, increasing the likelihood for engagement in violent collective outbreaks (Gurr, 1970).

Although RDT provides a compelling narrative, over the years it has become unfavored as a comprehensive explanation for the emergence of riots by many researchers, especially political scientists. Yet, RDT retained some interest within social psychology (Brush, 1996; Smith, Pettigrew, Pippin, & Bialosiewicz, 2012) and beyond (Wilkinson & Pickett, 2007).

We argue that a re-evaluation of RDT is due. The strength of the theory is that it provides a framework in which the connection between individual, subjective mental states at the micro level and social behaviour at the macro level can be studied, especially by collecting experimental data. It also places emotion to the fore. Although some have argued, following the Le Bon tradition, that emotional aspects are part of the irrationality of collective behaviour, we contend that by linking riots to emotions, RDT by no means suggests that rioters are not acting purposefully or meaningfully, lack self-control or are morally irresponsible.

## PAST PERSPECTIVES

Gurr (1970) defined relative deprivation as the *perceived* discrepancy between what people think they ought to have (expectations) and what they actually have (capabilities). When people compare themselves to others or some standard and perceive themselves as being at an *unfair* disadvantage, this causes frustration, with aggression being a likely response (Berkowitz, 1989; Smith et al., 2012). Following this reasoning, the primary individual motivation to riot emerges from the experience of negative affect in response to perceived injustice.

The theory of relative deprivation has been subjected to much criticism on conceptual and empirical grounds. Conceptually, feelings of relative deprivation and accompanying emotional grievances do not appear sufficient or even necessary to generate riots. So-called ‘celebration riots’ by fans of victorious sport fans constitute manifestations of collective bursts of violence in the absence of negative affect (McPhail, 1994). Reports by people gathering to riot also show that the reasons to engage in social protest extend far beyond the expression of hostile aggression, such as accompanying others, protesting *against* the rioters by advocating non-violence, or taking part in opportunistic looting (McPhail, 1994). How could this variety of

behaviours be explained by a single feeling of frustration? This led researchers to believe that relative deprivation may only capture parts of the phenomena of rioting, if any.

RDT has also fallen short of explaining how individual hostile impulses become shared and give rise to *collective* violence. Rioting only takes place in particular socio-political structures in which individual feelings of frustration become momentarily coordinated (Brush, 1996; Tilly, 1971), and in which a common social identity and norms of behaviour are shared among rioters (Reicher, 1984; Stott et al., 2018).

In addition to these conceptual issues the theory frequently did not pass empirical tests. Analysing the occurrence and severity of riots in relation to socio-economic status, often used as an indirect measure of relative deprivation, researchers found little evidence for its influence on rioting behaviour (Brush, 1996; McPhail, 1971). Although evidence for a link between relative deprivation and support for collective protest was published (Walker & Mann, 1987; Wright, Taylor, & Moghaddam, 1990), researchers were not able to convincingly demonstrate that the theory could be fit to real-world data (McPhail, 1971; Miller, Bolce, & Halligan, 1977).

Racial disorders in the US during the 1960s, for example, seemed unrelated to various aggregate measures of economic deprivation at the location of the disorder (Spilerman, 1976). Similarly, violence in France between 1830 to 1960 did not seem related to episodes of economic hardship (Snyder & Tilly, 1972). Muller (1972) surveyed peoples' perception of where they stood compared to others in their work situation, income and housing conditions. These measures were also only weakly related to individuals' willingness to engage in political violence.

The rejection of RDT based on these early empirical tests may have been premature, as they were purely correlational in nature and they may have failed to capture a crucial element of the theory (Miller et al., 1977). RDT asserts that when people perceive themselves as being unfairly deprived feelings of anger, frustration, or resentment are critical for engaging in hostile aggression. Those *subjective* perceptions, however, cannot always be captured using *objective* indicators, as they may not coincide. Furthermore, perceived deprivation is more meaningful when comparisons are made with peers, or local and personally relevant competitors rather than with an objective national average of socio-economic position (Krupp & Cook, 2018; Stouffer, Suchman, DeVinney, Star, & Williams Jr, 1949).

# PRESENT PERSPECTIVES

The behavioural consequences of feeling relatively deprived have recently been studied in the laboratory. In a series of experiments (Greitemeyer & Sagioglou, 2016, 2017), participants were told that they were of lower socio-economic status (SES) than a relevant comparison group. As a result, they behaved more aggressively than those participants who believed they were of a higher socio-economic status. Their aggressive behaviour ranged from comparatively more unfavourable personal judgments to placing more needles in a doll to punish another person. The researchers concluded that low subjective SES increases, rather than that high subjective SES decreases, levels of verbal and physical aggression.

Abbink and colleagues studied the relationship between relative deprivation and people's willingness to behave aggressively as part of a group (Abbink, Masclet, & Mirza, 2018). In their study, groups of participants were pitted against one another to obtain tokens that would subsequently translate into a monetary reward. Importantly, the price for obtaining the tokens differed between groups, introducing an unfair asymmetry. Later in the experiment, participants had a chance to engage in hostile actions against the other group by burning their money, if they managed to coordinate with their group. Individuals in disadvantaged groups were more prone to engage in antisocial behaviour than were individuals in advantaged groups.

Hostile behaviour has also been reported in economics studies. People have been found to reject unfair monetary offers in an ultimatum game even if consequently all players walk away empty-handed (GŸth, Schmittberger, & Schwarze, 1982). While this behaviour seems irrational on first sight, many researchers believe that it provides evidence for a preference for fairness and inequity aversion (Fehr & Gintis, 2007). Researchers have also suggested that the rejection of an unfair offer is a psychological response to an integrity or status threat through which the responder can avoid subjugation (Yamagishi et al., 2012).

A counter argument is that people are not averse to economic inequality per se, but to economic unfairness instead (Starmans, Sheskin, & Bloom, 2017). In lab studies people are usually in favour of equality and will punish inequality. When people are asked about their preferences in the real world, however, they report an inclination towards a certain amount of inequality. The most likely explanation is that in the lab, participants cannot distinguish between each other based on need and merit, but in the real-world people take these considerations into account.

This suggests that RDT may have previously been rejected by researchers who had not distinguished carefully enough between structural inequality and perceived unfairness. Riots are unlikely to occur simply because inequality exists, but they may occur when the existing inequality is perceived as unfair and illegitimate, as suggested by qualitative studies investigating the motivations of protestors in the English riots of 2011 (Lewis et al., 2011; Lightowlers & Quirk, 2014) or the Stockholm riots of 2013 (Lund, & Kings, 2014).

One may of course argue that the experimental evidence cited here only indirectly supports a link between relative deprivation and rioting for the inequality and unfairness that people experience in a laboratory setting is relatively innocuous. However, laboratory experiments can reveal mechanisms that are comparable to real-world processes and they can make causal claims that correlational studies alone cannot. This is the gap tin the literature that we aim to address.

# FUTURE PERSPECTIVES

Relative deprivation can be an important concept to understand the emergence of riots, if a few conditions are met. First, relative deprivation should be measured subjectively, rather than inferred from a set of objective socio-economic indicators (Miller et al., 1977; Smith et al., 2012), and the social comparisons should be relevant to the subject (Stouffer et al., 1949). Second, the discrepancy between peoples' expectations and a perceived reality has to be considered as unfair and any disadvantage needs to be perceived as illegitimate and not based on one's own responsibility (Smith et al., 2012). Third, a distinction should be drawn between individual or egoistic deprivation (the extent to which an individual feels deprived), and group or fraternal deprivation (the extent to which one feels one's own group is deprived compared to another group) (Walker & Mann, 1987). The differences between normative versus non-normative, and individual versus collective responses to perceived unfairness are equally critical (Wright et al., 1990). These distinctions help understand when people engage in collective protest and when they take individual courses of action (Walker & Mann, 1987).

Acknowledging that a link between perceived relative deprivation, associated feelings of frustration or resentment, and rioting may exist cannot be interpreted as evidence that people are simply acting out violent, disinhibited impulses. Research on Social Identity Theory has shown that during riots the establishment of a common collective identity leads to shared social norms, allowing groups to engage in empowered actions, to send meaningful socio-political messages, and to address enduring grievances and desires (Stott et al., 2018). While the focus in RDT and SIT is a different one, they are by no means mutually exclusive and investigation of both theories can only further our understanding of collective violence and the function of affective and identity-related factors.

In order to investigate the specific role relative deprivation may play in relation to rioting behaviour, an experimental approach has several advantages. It allows us to parametrically assess the contribution of the key variables of relative deprivation and measure their impact on aggressive collective behaviour. It can reduce or eliminate background information, such as a conflict history between groups that could hinder the unveiling of core psychological factors that trigger hostile reactions in participants. In a carefully designed experiment, subjective reports can be closely bound to participants' actions and responses instead of relying on what people think they would do, or what they claim to have done in the past. Recent technological developments in portable physiological monitors can help uncover the affective states of groups of participants who are in a state of relative deprivation even further.

A final key advantage of testing the link between relative deprivation and rioting experimentally is that the findings can be integrated with other perspectives in social psychology. Social identities play a key role in structuring social life, but how do they interact with relative deprivation? Do strong social identities protect against the frustration of deprivation, or do they exacerbate the differences between an ingroup and a relatively better-off outgroup? Do individuals tolerate relative deprivation when there is enough social mobility within a society to climb the social ladder, as others have suggested in recent research (Sagioglou, Forstmann, & Greitemeyer, 2018)? Is a collective (rather than an individual) response more likely when social identity is salient to the subjects (Lalonde & Silverman, 1994)? Lastly, which are the emotional states associated with individual relative deprivation that are likely to lead to aggressive and confrontational action (Osborne, Smith, & Huo, 2012)? Each of these questions can be fleshed out into a set of empirical manipulations and predictions.

People's responses to inequality are very diverse, highly complex, and dependent on personal, social, and situational factors. Perceived social injustice is not likely to be the only factor that can lead to rioting, nor will it always lead to it. The sort of minor aggressive or antisocial behaviour that may be induced in the laboratory is not comparable to the violence and destruction of a real-world riot either, taking place against the background of historical stigmatisation and often long-standing intergroup conflict. We still contend that although the magnitude of the forces will be greater in a real riot, the psychological mechanisms are likely to be the same in an experimental situation. If an arbitrary status manipulation in the lab can induce aggressiveness, a long-standing sense of relative deprivation surely can, too.

## CONCLUSION

Riots are not a frequent social phenomenon, but when they occur, they can be extremely costly. It is therefore of paramount importance to understand which factors contribute to the onset of collective violence. Relative deprivation theory aims to provide at least a partial explanation, but has been rejected in the past. Here, we have argued that the theory is due an empirical re-appraisal and we have reviewed evidence that shows that its propositions may have been dismissed prematurely. An experimental investigation of the relationship between relative deprivation and rioting will allow researchers to not only explore the role of emotions during times of social disturbance, but also to contribute to a rigorous, cross-disciplinary understanding of riots.

# METHODOLOGY

We investigated the effect of social inequality on collective self harm using a lab based, experimental method. Our goal was to complement the findings of the sociological approach, using a game that allowed us to manipulate the information available to participants, and measure in fine grained detail their response.

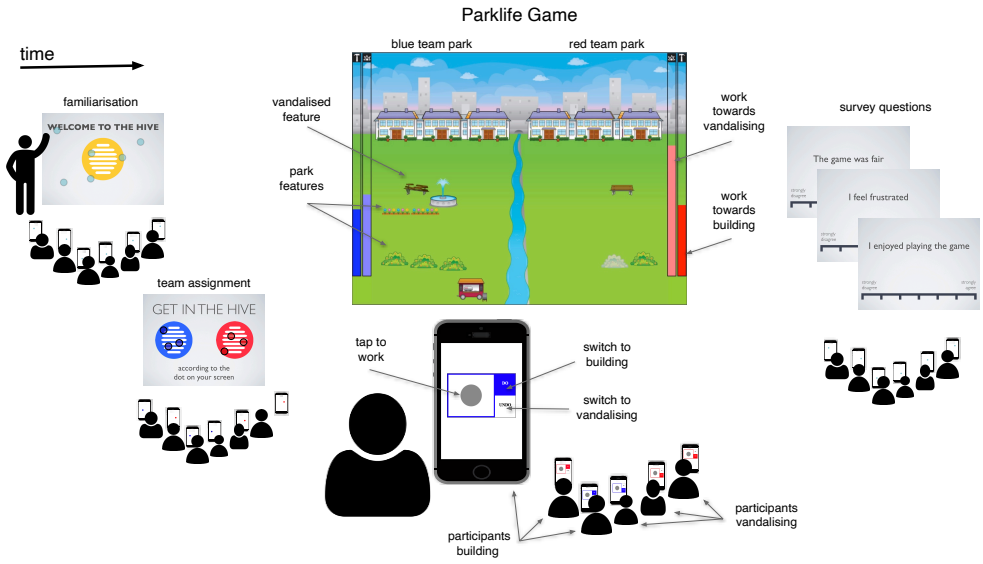
We do not intend our experiments to be anything like a *simulation* of being in a riot, with all its real-world consequences. Our goal, following classic approaches in psychology, was to create a simplified experimental game that evoked the same features of unfairness, social identity and collective action that are present in riot. Though they exist at a different scale in a real world riot, we hypothesised that they would interact in the same way in the world of our game. Therefore, with carefully controlled experiments, we can test hypotheses about the underlying psychological processes of both our game and a real riot.

Unlike past studies of relative deprivation and collective violence, our paradigm measures actual, direct and face-to-face collective destructive efforts (rather than intention to join a protest, or individual aggressive behaviour), and unlike other studies of inter-group competition (e.g., Aaldering & Böhm, 2019), our study allows groups to act in real time. In this way, our experimental paradigm captures a key aspect of riots: they are a complex emergent phenomenon. We then employed agent based models to provide insight into complex behaviour that unfolds over time (Smith & Conrey, 2007). These models tested a number of hypotheses related to the central mechanisms that drive emergent phenomena in collective behaviour – frustration and perceived relative deprivation, social identification and social norms – and to see how they interact with inequity and relative deprivation produced by our game.

For clarity of exposition, we have divided the description of our methodology and key findings into three sections: experiments relating to the link between intergroup conflict and *social inequality*, experiments relating to the effect of *social identity*, and our *computational models* of Parklife behaviour. For greater detail about our experiments, data and models please see our research report that is appearing in the Proceedings of the Royal Society B (Dezechache, Allen, von Zimmermann & Richardson, in press). A preprint of the paper, and all our data and code are freely available (http://osf.io/btrn7)

# SOCIAL INEQUALITY EXPERIMENTS: METHODOLOGY

In a typical Parklife experiment, we recruited 6 to 12 people to play in small groups sat around a large screen. All our of our experiments were reviewed and approved by the UCL Ethics Board (#3828/003), and data were stored and analysed in accordance with GDPR regulations. Our participants were drawn from participant pools that gave us a representative sample of the UK population, from UK undergraduates, and from members of the public at events and museum installations. In more recent work, we have also run experiments with collaborators in India and Rwanda, testing hypotheses that we can then apply to our UK populations. Later in the course of the project, the Covid pandemic required us to move all of our data gathering activities online. This required us to create a whole server infrastructure that could connect people into a virtual room, where they could interact with each other live. Below we describe an experiment carried out in person, but the process was substantially the same, from the participants point of view, when playing online. We have found no systematic differences between people playing the game on-line or in person.




This is a schematic of a typical Parklife experimental session. After reading about the experiment and giving us their consent to take part, participants were familiarised with the interface we used. This was a system called the Hive, which takes responses from participants' mobile devices (such as moving a dot on screen) and collates them onto a shared central display (where all participants' dots can be seen moving). Participants were placed into teams then played one or sometimes two games of Parklife for 3 minutes each, and then they answered a series of survey questions.

To play Parklife participants tap on a circle on their device. Each tap contributes towards their team's total work, which is displayed by a rising bar at the side of the park. Once the bar reaches the top, a park feature (e.g., a bench or flower bed) is built. Participants also have the option of switching their efforts from 'do' to 'undo'. Tapping 'undo' contributes towards a second bar on the screen. When the undo bar has filled up, a feature in the park of the other team is vandalised, appearing on screen to be damaged.

In an *equal* game of Parklife, the two teams had to do the same amount of work to be rewarded with a park feature. In the other game, the unequal game, one of the teams had to tap twice as much to be rewarded with each feature, thereby producing an inequity of reward between the teams.

Across our experiments, we typically randomise whether it is the blue team or the red team who has to work harder. We found that the colour doesn't appear to matter to the behaviour of the team. For simplicity, in the text and figures presented here, the disadvantaged team will always be in red.

We reasoned that this structural difference between teams would induce feelings of relative deprivation in the red team and cause its members to engage in more acts of vandalism against the opposing team as compared to the other (advantaged) team.

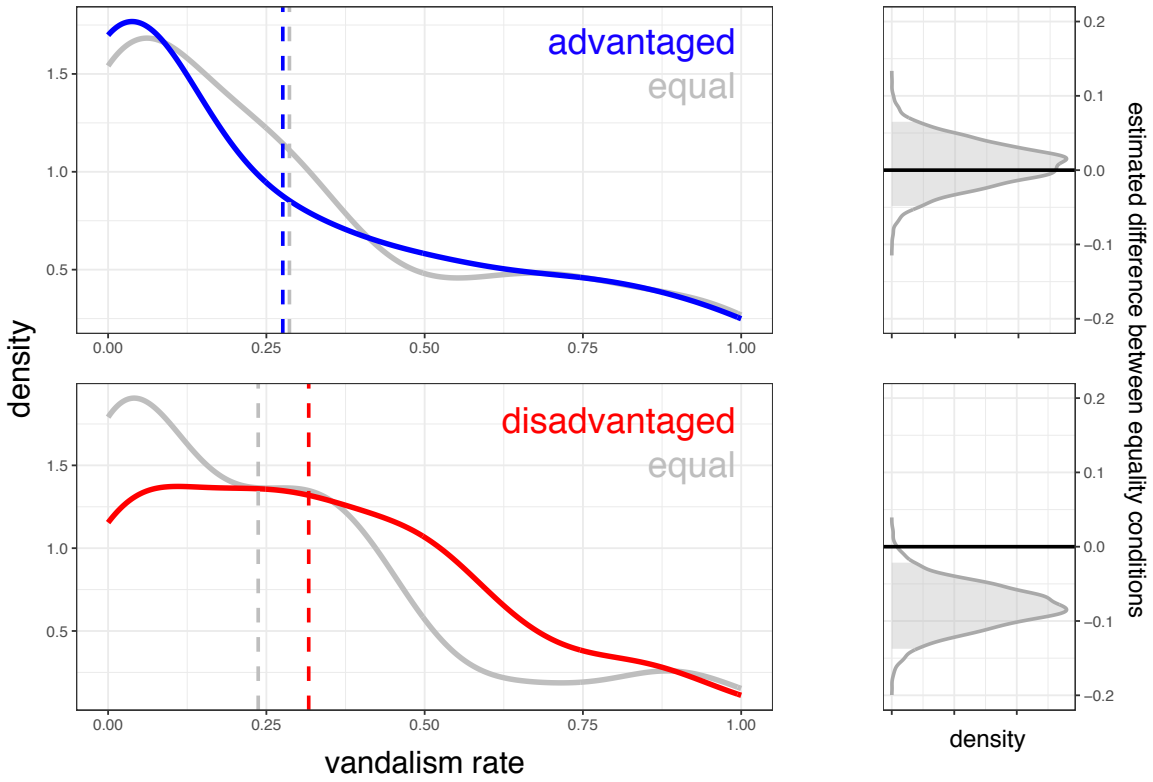
To test this hypothesis, we analysed individual's actions during the course of the games. Our key dependent variable was the vandalism rate: the number of participants' taps to undo (i.e., to vandalise the other team's park) as a proportion of the total number of taps that they made in the game. Using Bayesian mixed models, we analysed the vandalism rate as a function of game equality (equal vs. unequal), team membership (whether the individual was in the red or blue team for the unequal game).

# SOCIAL INEQUALITY EXPERIMENTS: KEY FINDINGS

We found that the experience of disadvantage can lead to acts of collective aggression. Here we show the data from our first, main experiment that used around 200 people. We have since replicated this experiment in many permutations of Parklife, with thousands of participants in total, and the same key finding is always replicated.

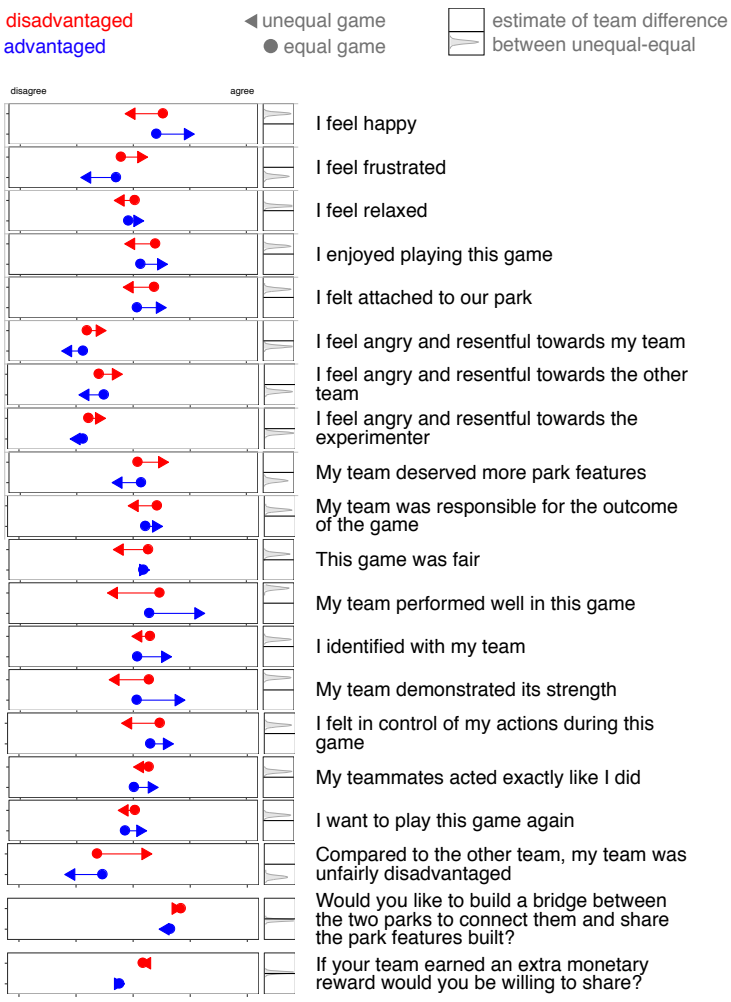
In our experiments, hostile behaviour took the form of damaging the other team's park. This behaviour was also detrimental to the individuals themselves, as they were spending time vandalising the opposition rather than improving their own park, or simply doing nothing. This suggests that these acts of collective destruction were not a cold, purely rational strategy to succeed at the task. Indeed, violent responses were associated with feelings of frustration, deprivation and of being treated unfairly.

The plot below shows the observed distribution of each players' proportion of clicks to vandalise. While vandalism rates are roughly the same in the equal games (grey lines), in the unequal games, there is a clear difference between the red and the blue teams.



To the right of the observed data, we show the distributions of the estimated differences between our experimental conditions. The percentage of this distribution that is greater than zero is known as the Maximum Probability of Effect (MPE), which directly quantifies the probability that the manipulation condition had an effect on behaviour. In the plot above we can see a grey area that corresponds to 95% of the estimate distribution. When this interval does not cover zero, it can be seen as strong evidence for a difference between conditions. As predicted, there was an increase in vandalism rates for the disadvantaged teams when they were in the unequal game compared to the game where they were treated equitably (MPE=99.7%). This was not the case for the advantaged teams, where there was no evidence of a difference between game types (MPE=62.1%).

Social inequality had a very different effect on participants' explicit ratings depending on whether they were advantaged or disadvantaged. Responses to post-game survey items in the equal (circle) and unequal (triangle) games are shown on the right. The first item shows that (compared to the equal game) in the unequal game the disadvantaged teams were less 'happy', whereas the advantaged teams were more 'happy'. To the right are Bayesian estimates of differences between advantaged and disadvantaged teams in the size and direction of these shifts in response inequity.




Critically, the disadvantaged teams felt that they deserved more park features and that their team was unfairly disadvantaged, suggesting they experienced a shared fate with others. They also reported higher frustration, anger and resentment in unequal vs. equal games as compared to the advantaged teams.

# SOCIAL INEQUALITY EXPERIMENTS: FUTURE QUESTIONS

We have shown that a mixture of social inequality and social identify can spur people to take collective action that can have negative consequences. We showed that this antisocial behaviour is not produced by a type of person, but by a particular situation. Will these results stir people to understand what it's like to experience social inequality, or at least have some empathy for those that do?

Sadly, perhaps not. While the red, disadvantaged team thought the game was unfair, the blue, advantaged players felt that they had performed better than others, and were personally more responsible for having a nicer park - even when they knew the game was stacked in their favour.

These blue team responses reveal what is called the 'just-world hypothesis'. People tend to believe (despite evidence to contrary) that the world is a fundamentally fair place. So if someone has succeeded in life - is a CEO of a company, say - we judge them as talented and gifted. And we tend to overlook the *situational* fact that their father owned the company. Similarly, if someone is in poor circumstances - without a home, for example - then we are likely to think that they probably deserved it due to their personal failings.

This 'fundamental attribution error' - assuming that someone's personal characteristics over their background, situation or luck determines their outcomes - is a massive challenge to how we think about social inequality.

Even in the petri-dish of Parklife, when we tell players that the game is unfair, people come away thinking that the winners worked harder and were better. Similarly, no matter what evidence is presented that some groups in society are systematically discriminated against (in school results, job opportunities or salary) there is a cognitive bias that pulls us towards thinking that those who are on top are there by merit, and those who are disadvantaged are deserving of their circumstance. So perhaps the biggest barrier to reducing social inequality is not just political, but psychological.

# SOCIAL IDENTITY EXPERIMENTS: METHODOLOGY

What's the difference between a collection of individuals, a group, and a team engaged in collective action? Psychologists have observed that people can feel different levels of shared *social identity* with other people. With a stronger social identity, a group will exert a stronger influence on an individual's behaviour (Stets & Burke, 2000; Terry et al., 1999). We set out to discover if varying types and levels of social identity would impact on a group's response to social inequality.

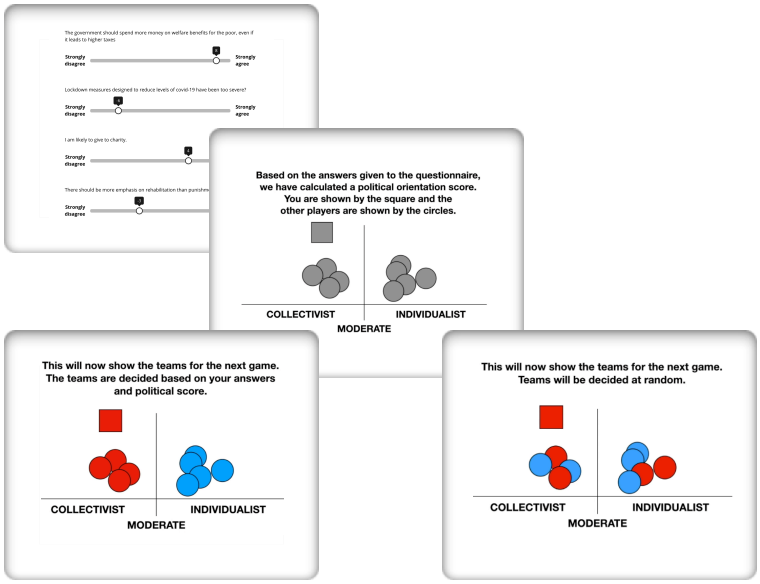
One study found that social identity was strongly correlated with willingness to participate in cyber-aggression on WhatsApp (Bleize et al., 2021). Researchers in France showed that the degree to which participants' identified as a 'yellow vest' is connected to their participation in the 2018 riots (Adam-Troian et al., 2021). In another study, researchers interviewed individuals following participating in the London 2011 riots and found that the majority of those who had participated in the riots shared a strong anti-police identity (Stott et al., 2018).

Our in standard Parklife experiments, we created what are called 'minimal groups' (Sachdev & Bourhis, 1984). Players were put into teams at random: as far as they know, all they shared was their membership in that arbitrary group. Past research has shown, however, that even these minimal groups are sufficient to produce in-group bias and out-group prejudice (Billig & Tajfel, 1973), and indeed, we found that minimal groups were enough to produce higher rates of vandalism in Parklife.

Our goal in these experiments was to draw on the insights of Social Identity Theory (Tajfel and Turner, 2019), and to explore how different types or levels of shared social identity might interact with social inequality to determine intergroup conflict. The experiments followed the same structure as described in the section above. The only thing we changed was the way in which we allocated individuals to teams.

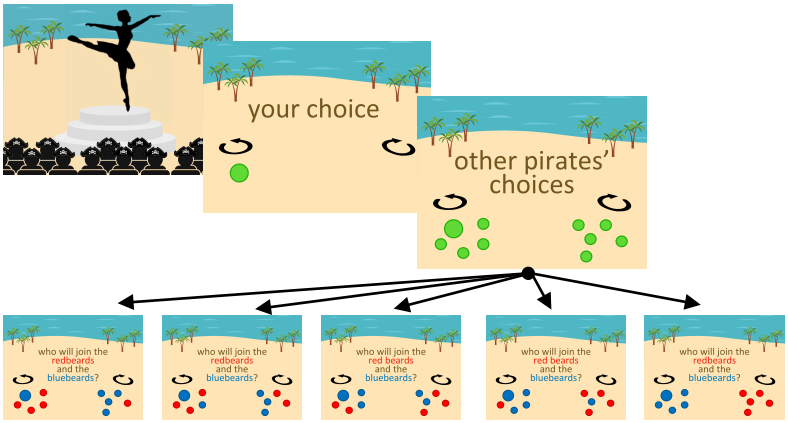
Across many experiments, each with over 100 participants, we used the same method, looking at different attributes such as wealth, social status, gender and beliefs about meritocracy and social mobility. In each case we were able to test, firstly, if participants with particular attributes or beliefs were more likely to vandalise, and secondly, whether it mattered if they believed that they shared those qualities with their team mates.

In this example of our method, we first surveyed people based on their political opinions. Then they were shown how they and the other players scored on a scale of collectivist to individualistic beliefs (in fact, the scores of the other players were faked). Then they were either put into groups at random, or based on their political orientation. Finally, they played Parklife in those teams.




In one other study, we looked at social identity in a different way, and manipulated the degree of group coherence: the number of team mates that a participant believes shares a particular quality. The study was part of a virtual museum installation in collaboration with the Science Gallery Bengaluru. In this interactive exhibit, the participants were given the roles of pirates on an adventure together.

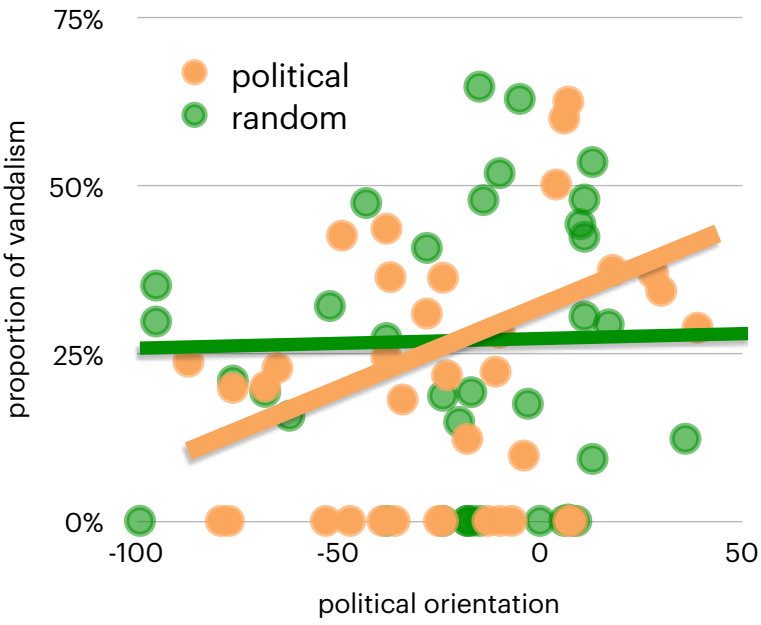
They were shown a spinning ballerina animation. The figure was a bi-stable ambiguous illusion: people can either see the rotation in one direction or another (Lucafò et al., 2016). We had told participants that 'some people say that the direction you see the spin reveals something about your personality and cognitive style' (as we explained after the experiment, people do make such claims online, but they are not actually true).



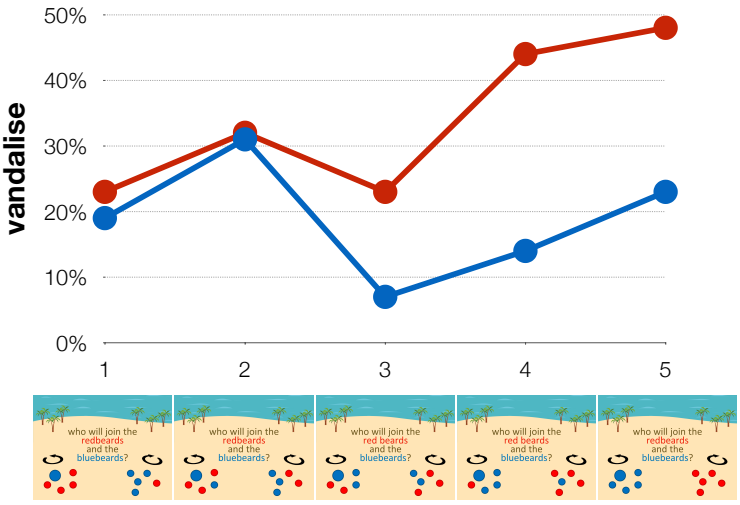

Participants indicated what they saw and then were given (false) feedback about what the others saw (top of figure). Then the dots changed colour to show who was on the red and blue teams (bottom). We varied the number of players on the participant's team who saw the same rotation. So participants played Parklife believing that they shared psychological attributes with all of their team mates, a few of them, or none at all. We hypothesised that this would vary the strength of shared social identity, and impact rates of inter group conflict.

# SOCIAL IDENTITY EXPERIMENTS: KEY FINDINGS

When we look at individual attributes such as political orientation or wealth *by themselves* we find that they have little connection to the propensity to vandalise. However, they can exert an influence when participants believe that they share those attributes. In this plot, we can see that for random team assignments, there is no correlation between individuals' political orientation and the amount of vandalism they carry out. But when the same type of people believe that their team mates share that orientation, there is a significant correlation. Interestingly, when an individual believes that their personal characteristics are shared by the group, now they determine behaviour.



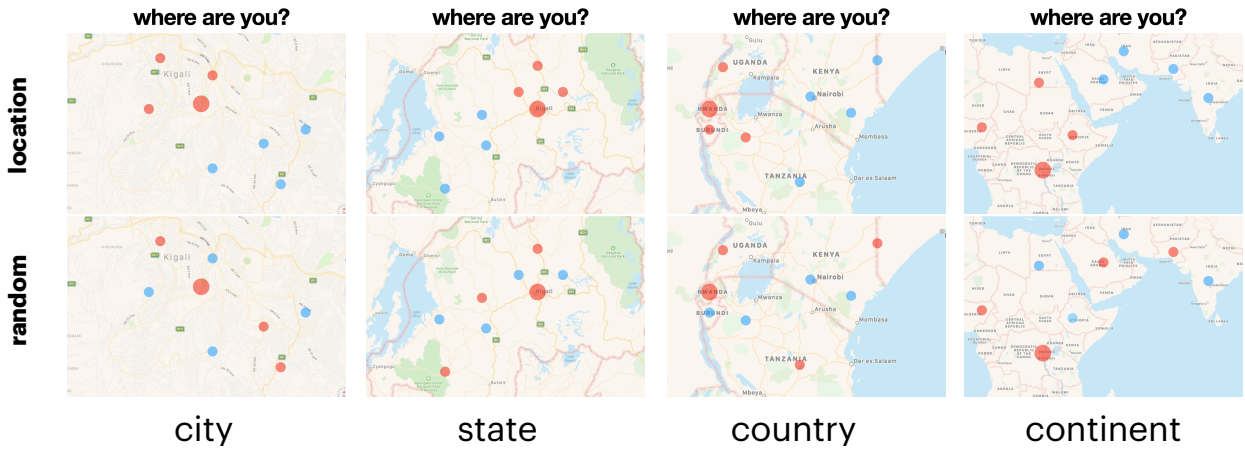

We found the participants were also influenced by the *number* of group members that they believed shared their own characteristics. As the shared social identity of their team gradually increased, their response to inequality grew. We first found this result with participants in India, and have since replicated it with a UK participant pool.



# SOCIAL IDENTITY EXPERIMENTS: FUTURE QUESTIONS

Political rhetoric often uses the sentiment, ‘we are all in this together’. But who does the ‘we’ refer to? For example, factors such as Brexit or the coronavirus crisis have had a disproportionate effect on different members of society. If we want to motivate people to do something about these inequalities - raise taxes to pay for income support, or send vaccines to developing countries - what social identities would resonate with people, and lead to positive social action?

This is a vital empirical question, of course, and we are currently exploring its implications. Rwanda is a country with great social inequality, and a horrific recent history of intergroup conflict. To motivate a response to these problems, what level of social identity would resonate most strongly? We will be testing this by having participants play Parklife on the streets of Kigali.




Individuals will show their current location on a map (large dot) and see the dots of the other people they are playing with showing their location (in fact, the responses are faked). Teams will then be allocated based on those locations (top row) or at random (bottom row). Which of these shared social identities - by city, state, country or continent - will have the greater impact? We hope an answer to this research question will have great implications for how multiple social identities content to collective action. We will take the lessons from our Rwanda data, and apply them to our UK participants, and the shifting identities - English, British, European - that can both divide and unite communities.

# COMPUTATIONAL MODELS: METHODOLOGY

When we look at simple measures of behaviour in Parklife, such as the total proportion of vandalism, standard statistical techniques can inform us when there are significant effects between between conditions in our experiment. But our data are far more complex, as multiple participants are interacting in continuous time. Standard analysis techniques can't tell us how or why they are acting at each moment in time. So we used a technique called Agent Based Modelling (ABM).

In ABMs, individual agents follow at set of rules that govern how they interact with each other and their environment, in a virtual world created by the computer. For example, agents could be cars in a computer model of city streets. Each car is programmed to accelerate to the speed limit, and slow down when gets too close to other cars. An ABM can then be used to simulate and predict the effects of new road layouts on traffic flow at different times of day. ABMs allow us to model quite complex interactions over time, and agents can be as complicated as needed to understand the phenomena.

In our ABMs, the agents were models of real life participants.  By endowing these agents with certain characteristics and allowing them to interact in different ways, we can understand how inequality and other's behaviour impacts our participant's decisions. Our model was designed to mimic Parklife as closely as possible: each agent within the model is placed in a team in either the equal or unequal condition, plays the game for 180 seconds, and can work or vandalise. The agents have access to the same information as the participants in Parklife, i.e., the number of features in the parks, and the number in each team working or vandalising at any one time. Agents may decide to work or vandalise based on park differences or the behaviour of others.

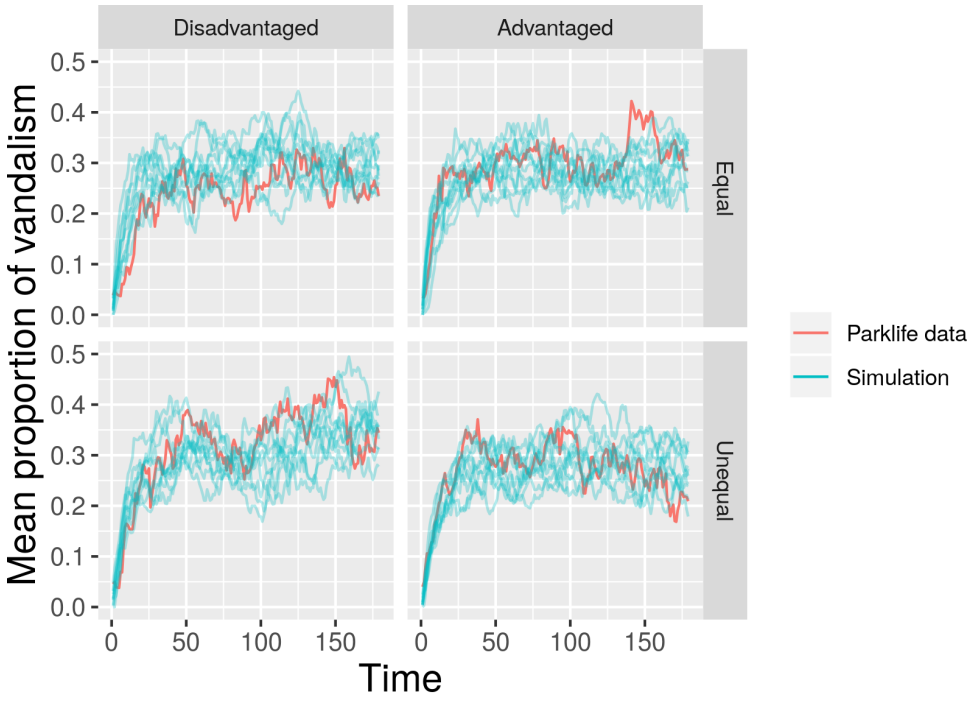
We created a series of different ABMs, where the agents followed different rules, or were more or less sensitive to each other's behaviour and the state of the two parks. By comparing these different ABMs to the behaviour of our real participants, we can estimate the parameters of the model, and therefore infer the motivations and drivers of participants' behaviour. The key theories tested using this model were relative deprivation and theories of social identity and norm formation.

# COMPUTATIONAL MODELS: KEY FINDINGS

The model found that relative deprivation, in the form of park comparisons, was a key driver of the increase in vandalism observed between the disadvantaged and advantaged team. However, the model was also able to demonstrate other factors at play in Parklife. In particular, our model identified that individuals were coordinating behaviour within their teams, ensuring that if others were working to build their park, this was counterbalanced by vandalising the other park, and vice versa.

From our models, we concluded that participants spend the majority of their time focusing on the state and behaviour of their own team. However, over time park differences increase, and so on the minority occasions that cross park comparisons are made, those in the unequal, disadvantaged condition become frustrated, and vandalise. In the full model, our findings suggest that players focus mainly on their own team, and coordinate their behaviour by performing the opposite function of those on their team (i.e. if many team mates are working, they vandalise, and vice versa). Participants balance team behaviour between working and vandalising, providing evidence of coordinated behaviour across the teams.

As an example of the model, in the figure below we plot ten example runs for each team, and for each game, using the best fitting parameters, and show that our model (blue lines) does indeed closely match the Parklife behaviour (red lines).

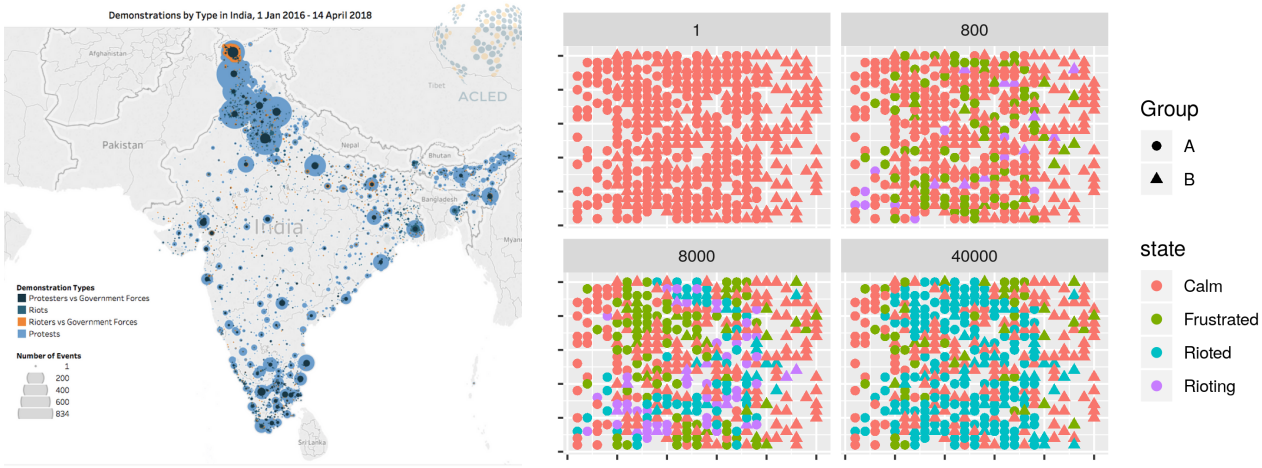


To further test the motivations and mechanisms for vandalism in Parklife, we ran two simpler versions of the model: (the frustration-only and asocial models) in which individuals do not pay attention to others' behaviour. In the frustration-only model we remove the importance of social norms. The asocial model is designed to test if participants were simply tapping randomly or performing a cost-benefit analysis in keeping park differences to a minimum: if the latter those in the disadvantaged team in the unequal game would choose to vandalise rather than work with a higher probability, as this decision reduces the effort to change the state of a park/reduce park differences.

Comparing our different models, we find positive evidence for the full model over the asocial model and we therefore conclude that individuals are behaving by neither tapping at a base rate, or tapping at an increased constant rate in only the unequal, disadvantaged condition in order to keep park differences to a minimum. We found that there is also strong evidence for the full model over one the frustration-only model, therefore showing the importance of social norms and team behaviour in Parklife.

## COMPUTATIONAL MODELS: FUTURE QUESTIONS

To extend the theoretical aspect of this project we are taking the lessons learnt from the modelling of behaviour in the laboratory, and applying them to models of real riots and structural inequality.  To achieve this, we first represent each agent not as an individual in the lab but as a member of a real society, where now each agent is a potential participant in a riot, and extend our models into larger, spatially set populations.  Through our initial investigations, we have already begun to further our understanding of how different theories interact in real communities.




On the left is a map of India showing the occurrence of riots 2016-2018 (Swartzendruber, 2018). Clearly, they are not appearing at random but have some spatial component. On the right is 4 time steps of our new model, based on Parklife, that incorporates a spatial aspect to understand how riots may propagate. In previous models of riots in the literature, agents 'catch' rioting behaviour in the same way that you might catch a cold. Whilst these models tell much of the story of rioting, they miss a key part of the story from social psychology and our findings - the importance of inequality and identity. Therefore, by placing our computational models into a spatial framework, we will increase our understanding of how riots really spread. We are also in the process of applying and validating our ideas on the 2019 riots in India, modelling how the identities of different communities, and the geographical relationships between them may have resulted in the spread of these riots.

Currently, our modelling of both Parklife and real populations suggest that there are two regimes associated with riot-like behaviour. The first is the initial stage that moves individuals within a community from not considering collective self-destructive action, to those that might. This is where inequality is a key part of the story. However, once individuals within a community have become frustrated, they may then join a riot-like event through the imitation of norms. In other words, the effects of structural inequality come before the effect of social identities.

# IMPLICATIONS AND RECOMMENDATIONS

We believe that there are four key take home messages from the Parklife project. Each has particular implications for policy, practice and future research.

## INTERGROUP HOSTILITY IS NOT JUST CAUSED BY PARTICULAR TYPES OF PEOPLE

In the aftermath of any riot, blame will fall onto a select number of 'bad apples' or a 'criminal minority'. A narrative will develop that in the heat of the moment, such people become 'feral', unthinking, and lose their minds to the mob. Careful analysis of real world riots has long suggested this is not the case (Stott et al 2018), that those who riot do so because of distinct, identifiable motivations that are often entwined with their groups historical and current situation. But the suspicion remains that only a certain type of person would ever engage in a riot. The data from our Parklife project suggest that this is not the case.

Firstly, we find no evidence that a particular personality or demographic type is solely responsible for intergroup conflict. Secondly, we find that all participants, when faced with the circumstance of inequality, are more likely to engage in aggressive collective action. Riots are made by situations, not people.

However, our data also show that even in the simple situation of our Parklife game - when we tell participants that it is transparently unfair - players who were advantaged walk away with the belief that that are better at the game, they deserve their success, and that the game was probably fair. They attribute their success - and the disadvantaged teams failing - not to the systematic bias in the game, but to differences between the characteristics of people who were playing on either team.

A clear policy implication of this work is that it is wrong to demonise those involved in a riot, and drawing the conclusion that it is their personal failings alone that are responsible. Dismissing rioters in animalistic language may serve some political purposes, but it detracts from the real, potential systemic and historic causal roots of the riot. Educating policy makers and stake holders in the particular history of a rioting community may help in these circumstances. And so, we would argue, would be educating them in the psychology of social inequality, demonstrating that anyone placed in that situation has a common response.

## INEQUALITY BETWEEN GROUPS HAS A DIRECT, CAUSAL EFFECT ON LEVELS OF INTERGROUP CONFLICT

It is not just the economic resources that an individual has that predicts their outcome: the resources that others have matters too. The distribution of resources in society has a psychological impact on individuals. Epidemiologists have observed, at the population level, that factors such as mental health and incarceration are strongly related to levels of inequality (Wilkinson & Pickett, 2007). Our work shows that at the level of individual and group behaviour, inequality has a direct link to acts of collective aggression.

The key lesson for both policy makers and those that study riots are that both social inequality and social identity are key factors, and rather than being distinct causes, interact to produce the patterns of vandalism observed in Parklife and explored in our computational models.

A policy implication of these results is to add rioting behaviour to the list of societal ills that are due, at least in part, to social inequality. Groups that are concerned with the widening economic gap, who advocate for progressive taxation or universal minimal wages, could be encouraged and motivated by our results. In our games, the only outlay for discontent is to engage in vandalism. But in the real world there are other forms of collective action - protest, community organisation, collective bargaining - that perhaps could harness that response to inequality in more constructive ways.

## THE SOCIAL IDENTITY OF A GROUP HAS A PROFOUND EFFECT ON THEIR RESPONSE TO SOCIAL INEQUALITY

In our experiments and computer models, we found that it is the social identity shared by a group that drives their response to social inequality. As we titrated the level of this shared identity, it compounded their response to unfairness. It was only when participants were led to believe that they shared political opinions with their team members that those opinions had any causal effect on their actions.

The implication here is that how we frame, talk about and address different social groups might have an immediate effect on their collective action. We all have multiple social identities that can be more or less prominent. For example, during the London riots of 2011, should the police have appealed to the 'friends of family of Mark Duggan', 'Residents of Tottenham' or 'Londoners' if they wanted to calm the situation? This is a vital empirical question, of course, and we are currently exploring its implications with experiments in Rwanda, before mapping those findings back onto the UK.

## INEQUALITY AND SOCIAL IDENTITY CAN BE USED TO MODEL THE OUTBREAK AND SPREAD OF COLLECTIVE ACTION

We believe that the computational models developed in our project have exciting implications for understanding and predicting social unrest. We have taken the lessons learnt from the modelling of behaviour in the laboratory, and applied it to models of real riots and structural inequality. Through our initial investigations, we have already begun to further our understanding of how different theories interact in real communities.

Our modelling of both Parklife and real populations suggest that social inequality and social identities come into play at different times during the outbreak and then spread of a riot.  Therefore, our models suggest policy makers must take into account a history of inequality and group membership, and that which factors are important depends on the point in the riot cycle that the community finds itself.

# FINAL REMARKS

Why did the Black Lives Matter movement gain such momentum so rapidly from 2013 onwards? The economic and social inequalities between Black and White America were not dramatically different in the years before, and arguably were worse. But following the murder of Trayvon Martin, and a series of egregious police shootings, a powerful social identity was formed and shared around the world. Interestingly, those who push back against this movement for social change do so by arguing 'all lives matter'. This, of course is not a logical counter argument to 'black lives matter'. Rather, we would argue, it is an attempt explicitly trying to dilute that shared social identity, and so sap the movement of its impetus for change. This interplay between social identity and social equality - that has played out in the real world in the Black Lives Matter movement - is precisely the dynamic that we have been exploring in the laboratory.

Parklife has taught us a great deal about how people react to social inequality. It has shown us that more than any individual traits or weaknesses, it is the situation of being faced with disadvantage that can bring anti-social aggression out in anyone, and that shared social identities play a pivotal role in fostering collective action. We believe that our experimental work and computational models have mapped out to a new level of detail these complex dynamics between individual and group behaviours and systemic features of their environment. We also hope that this work will encourage those invested in understanding the effects of inequality to use a wide variety of tools - psychological, computational and sociological - to understand these emergent behaviours. Finally, we hope that these results have brought new evidence to bear on long standing issues of social discontent, and new impetus to political efforts to address social inequality.

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